Note ichtyologique / *Ichthyological note*

Occurrence of an exotic silverside most closely related to *Atherinomorus lacunosus* (Atherinidae) in southern Tunisia (central Mediterranean)

by

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RÉSUMÉ. - Présence d'une athérine exotique, proche de *Atherinomorus lacunosus* (Atherinidae) en Tunisie méridionale (Méditerranée centrale).

Trois athérines exotiques de l'espèce *Atherinomorus lacunosus* (Forster *in* Bloch and Schneider, 1801) ont été récoltées pour la première fois en Tunisie, à l'intérieur de la Bahiret El Biban, lagune hyperhaline qui jouxte le golfe de Gabès, dans le sud du pays. Des caractères biométriques et méristiques et une description succincte de l'espèce sont présentés. *A. lacunosus* doit être incluse parmi les immigrants lessepsiens recensés depuis plusieurs décennies dans les eaux tunisiennes.

Key words. - Atherinidae - *Atherinomorus lacunosus* - Bahiret El Biban - Gulf of Gabès - Tunisia - Lessepsian migrant - First record.

Until recently one atherinid species, *Atherina boyeri*, was known to occur in Tunisian waters, where it is caught in large numbers in lagoons and inshore waters (Bradaï *et al*., 2004). Recent investigation conducted in the Bahiret El Biban, hyperhaline lagoon, which adjoins the Gulf of Gabès in southern Tunisia, enabled us to collect for the first time in Tunisian waters, three specimens of *Atherinomorus lacunosus* (Forster, *in* Bloch and Schneider, 1801). This silverside is widely distributed in the Indo-Pacific from the Red Sea, eastern Africa to Japan and central Pacific (Golani *et al*., 2002). It has migrated into the Mediterranean Sea through Suez Canal and was first reported off Alexandria, northern Egypt by Tillier in 1902. Subsequently, the species successfully established itself in the eastern Levantin Basin (Golani, 1996) and is now commonly caught throughout the area (Golani *et al*., 2002). *A. lacunosus* has been recorded off the eastern coast of Libya (Zupanovic and El Buni, 1982) and, in that region, according to Ben Abdallah *et al*. (in press), the species is very common, specially in lagoons and over rocky bottom in shallow waters.

In this paper, we give a short description of the Tunisian specimens and we comment on the distribution of the species in the area and in the Mediterranean Sea.

DESCRIPTION OF THE TUNISIAN SPECIMENS

On 5 January 2005, three specimens of *Atherinomorus lacunosus* were captured in the Bahiret El Biban (Fig. 1), inside a fish-trapping built in front of the Gulf of Gabès, at a depth of about 1.5 m, by using a spoon-net with a mesh size of 3 mm, over sandy bottom, partially covered by a sea-grass bed comprising *Posidonia oceanica* and *Cymodocea nodosa* (33°15'N, 11°28'E).

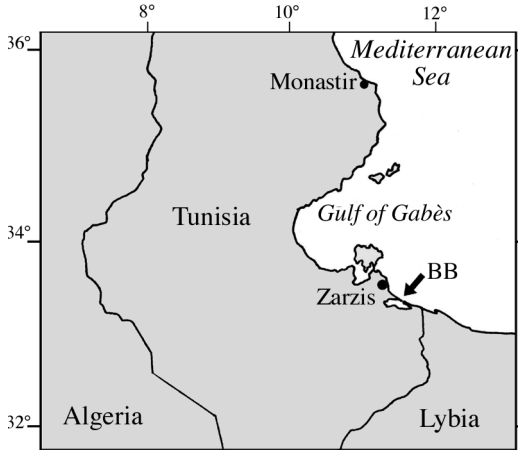

Figure 1. - Map of Tunisia showing the Gulf of Gabès and the capture site of the Tunisian *Atherinomorus lacunosus* in the Bahiret El Biban (as BB pointed out with black arrow). *[Carte de la Tunisie indiquant le golfe de Gabès et le lieu de capture d'*Atherinomorus lacunosus *dans la Bahiret El Bibal (BB et flèche noire).]*

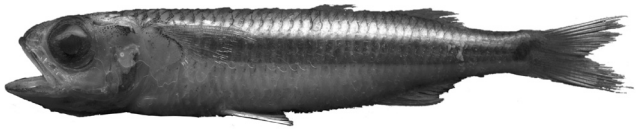

Figure 2. - *Atherinomorus lacunosus* (ATH-Atl-01) captured in the Bahiret El Biban. *[*Atherinomorus lacunosus *(ATH-Atl-01) capturé dans le Bahiret El Biban.]*

The specimens were preserved in 5% buffered formalin solution and deposited in the Ichthyological Collection of the Institut national agronomique de Tunisie, catalogue number ATH-Atl-01 (Fig. 2), ATH-Atl-02 and ATH-Atl-03, respectively.

Morphometric measurements and meristic counts are presented in table I, following Quignard and Pras (1986) and Golani *et al*. (2002). The specimens measured 99.0, 103.6 and 106.6 mm in total length, and weighed 10.3, 11.5 and 13.7 g.

The Tunisian specimens are described as follows: body rather long, robust, subcylindrical, moderately flattened. Two well-separated dorsal fins, the first with 5-6 flexible spines originating behind

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Table I. - External morphometrical measurements and counts carried out on the three Tunisian *Atherinomorus lacunosus* (ATH-Atl-01, ATH-Atl-02 and ATH-Atl-03). *[Mesures morphométriques et comptes réalisés sur les trois spécimens tunisiens d'*Atherinomorus.*]*

	Measurements (mm)			Times in eye, HL or SL			
Specimen	ATH-Atl-01	ATH-Atl-02	ATH-Atl-03	1	2	3	Mean of 65 Indo-Pacific specimens
Total length (TL)	99.0	103.6	106.6				
Fork length	91.1	95.3	98.1				
Standard length (SL)	81.6	84.9	88.6				
Head length (HL)	22.5	23.7	24.9				
				In eye			
Snout length	4.8	5.1	5.8	1.75	1.59	1.43	1.70
Upper jaw length	10.3	10.4	10.6	0.82	0.78	0.78	0.90
Lower jaw length	9.1	9.6	9.6				
				In HL			
Eye diameter	8.4	8.1	8.3	2.68	2.93	3.00	2.60
Interorbital	7.8	8.2	8.3	2.88	2.89	3.00	2.80
Body height	17.5	17.5	18.4				
Body depth	12.5	12.9	14.0				
Snout tip to vent	42.9	44.2	46.4				
1st Dorsal fin length	8.1	9.0	10.0				
1st Dorsal fin base	4.5	4.7	4.5				
2nd Dorsal fin length	10.5	10.2	11.8				
2nd Dorsal fin base	11.3	10.5	12.0				
Pectoral fin length	17.3	18.8	18.9				
Pectoral fin base	5.6	7.3	6.5				
Pelvic fin length	11.7	11.9	12.8				
Pelvic fin base	2.4	2.3	2.6				
Anal fin length	11.5	11.5	11.3				
Anal fin base	13.2	13.4	16.6				
Caudal fin upper lobe length	17.4	16.6	16.2				
Caudal fin lower lobe length	17.7	16.9	16.1				
Caudal fin height	17.7	16.9	16.1				
				In SL			
Pre-pelvic length	31.7	31.5	38.0	2.57	2.70	2.33	2.40
Pre-pectoral length	22.1	21.9	24.6				
Pre-dorsal length	48.1	47.0	49.3				
Pre-anal length	56.6	56.0	60.8	1.44	1.52	1.46	1.40
Axillary scale length	7.2	7.5	7.7				

Meristic counts				
Specimen	ATH-Atl-01	ATH-Atl-02	ATH-Atl-03	Mean of 65 Indo-Pacific specimens
First Dorsal fin spines	VI	VI	V	VI
Second Dorsal fin soft rays	10	11	11	8.5
Anal fin spines	I	I	I	I
Anal fin soft rays	13	13	14	13
Pectoral fin soft rays	17	16	17	15
Pelvic fin spines	I	I	I	
Pelvic fin soft rays	5	5	5	
Gill-rakers	31	30	32	23
Pre-dorsal ctenoid scales	18	18	18	
Scales in longitudinal series	41	40	42	40

midpoint. Second fin and anal fin opposite each other. Indian and Pacific Ocean fish have the second dorsal at least a scale behind vertical through anal fin. Anal fin with one spine and 13-14 soft rays. Caudal fin forked. Pelvic fin with one spine and five soft rays, abdominal in position well in front of midpoint. Large head, more than four times in total length (head does not exceed 4.1 mm in SL and mean is 3.5 mm in SL in Indian and Pacific Oceans fish). Large eye, its diameter more than 2.5 times in head length. Mouth terminal and not protrusible. Dorsal process very short, thus not allowing the upper jaw to protrude, in contrast of *Atherina boyeri* Risso, 1810 which has a long dorsal process of premaxilla allowing the mouth to protrude. Small villiform teeth on the premaxilla, palatine and vomer. Scales in longitudinal series from 40 to 42. Eighteen predorsal scales. Gill-rakers long, total number from 30 to 32 in the first arch. Anterior edge of preopercular with clear notch above its angle. Colour of back grey to beige with white belly. A broad silvery stripe along the body sides.

According to Bucciarelli *et al*. (2002), *Atherinomorus lacunosus* is a cryptic species and the population of the Mediterranean Sea is most similar to the northern Red Sea population but differs from other populations in the southern Red Sea.

Atherinomorus lacunosus is a brackish and marine species which lives in shallow waters (Ivantsoff and Crowley, 1991) and reaches 150 mm total length (Kuiter and Tonozuka, 2001). It feeds on zooplankton and small bottom living invertebrates (Quignard and Pras, 1986).

DISCUSSION

Description, morphometric measurements and meristic counts are in agreement with Quignard and Pras (1986) and Golani *et al*. (2002). So, *Atherinomorus lacunosus* should be included in the Tunisian ichthyofauna together with other Lessepsian migrant species (Bradaï *et al*., 2004). The occurrence of *A. lacunosus* was previously suspected in Tunisian waters by one of us, and especially in the Bahiret El Biban, where silversides are considered as by-catch species in this area and are discarded. However, during 2004, several dredging made in the Bahiret El Biban (Ben Abdeladhim *et al*., 2005) enabled us to collect small teleost species such as *Aphanius fasciatus*, *Syngnathus acus* and *Atherina boyeri*. No *A. lacunosus* was identified during sampling. Moreover, the species was not identified northward, off Monastir, for instance, where silversides are captured by turning seine named 'hlig' in Arabic, and targeted for human consumption as dried fishes, very appreciated by local population. *A. lacunosus* collected in Tunisian waters is the westernmost record of the species so far recorded. It is however a common species in the eastern Mediterranean Sea as reported by Golani *et al*. (2002).

REFERENCES

BEN ABDALLAH A.R., ALTURKY A.A. & A.A. FITURI, in press. - The exotic fishes in the Libyan coast (Arabic). *Bull. Mar. Biol. Res. Cen., Tripoli, Libya*.

BEN ABDELADHIM L., BEN SOUISSI J., MÉJRI H. & J.L. CARBALLO, 2005. - Occurrence of *Pachypygus gibber* (Thorell, 1859) (Copepoda: Notodelphyidae) in the tropical sea squirt *Ecteinascidia turbinata* from Tunisian waters (Central Mediterranean). 194 p. Hammamet, Tunisia: Proceedings of the 9th International Conference on Copepoda, 11-15th July 2005.

BRADAÏ M.N., QUIGNARD J.-P., BOUAÏN A., JARBOUI O., OUANNES-GHORBEL A., BEN ABDALLAH L., ZAOUALI J. & S. BEN SALEM, 2004. - Ichtyofaune autochtone et exotique des côtes tunisiennes : recensement et biogéographie. *Cybium*, 28(4): 315-328.

BUCCIARELLI G., GOLANI D. & G. BERNARDI, 2002. - Genetic cryptic species as biological invaders: The case of the lessepsian fish migrant, the hardyhead silverside *Atherinomorus lacunosus*. *J. Exper. Mar. Biol. Ecol*., 273: 143-149.

GOLANI D., 1996. - The marine ichthyofauna of the Eastern Levant. History, inventory and characterization. *Isr. J. Zool*., 42: 15-55.

GOLANI D., ORSI-RELINI L., MASSUTÍ E. & J.-P. QUIGNARD, 2002. - CIESM Atlas of exotic species in the Mediterranean Sea. Vol. 1, Fishes (Briand F., ed.), 256 p. Monaco: CIESM Publishers.

IVANTSOFF W. & L.E.L.M. CROWLEY, 1991. - Review of the Australian silverside fishes of the genus *Atherinomorus* (Atherinidae). *Aust. J. Mar. Freshw. Res*., 42(5): 479-505.

KUITER R.H. & T. TONOZUKA, 2001. - Pictorial guide to Indonesian reef fishes. Part 1. Eels - Snappers, Muraenidae - Lutjanidae. *Zoonetics, Australia*: 1-302.

QUIGNARD J.-P. & A. PRAS, 1986. - Atherinidae. *In*: Fishes of the North-Eastern Atlantic and the Mediterranean, Vol. III (Whitehead P.J.P., Bauchot M.-L., Hureau J.-C., Nielsen J. & E. Tortonese, eds), pp. 1207-1210. Paris: UNESCO.

TILLIER J.E., 1902. - Le canal de Suez et sa faune ichthyologique. *Mém. Soc. Zool. Fr*., 15: 279-318.

ZUPANOVIC S. & A.A. EL BUNI, 1982. - A contribution to demersal fish studies off the Libyan coast. *Bull. Mar. Biol. Res. Cen., Tripoli, Libya*, 3: 77-122.

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